

ART. XIV.—*Note on the Habits of Ceratodus forsteri.*

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With the exception of a short account given by Mr. Caldwell before the Royal Society of New South Wales with regard to the spawning and reproduction of *Ceratodus* I am not aware of there being any note recently published with regard to the habits of this animal. Having lately had the opportunity of visiting the Burnett and Mary River districts, I was enabled to gain a little information with reference to its habits which may prove of interest.

As is well known, the group Dipnoi contains only three forms, of which one (*Lepidosiren*) is found only in Brazil, another (*Protopterus*) is confined to West Africa and the third (*Ceratodus*) at the present time exists only in the Burnett and Mary Rivers in Queensland. My remarks have reference to the Burnett District for though I was for a short time near the Mary River at Gympie I did not there come in contact with the animal.

In the first place, care must be taken with regard to the name; neither of the terms lung-fish or mud-fish, so far as my experience goes, is known to the settlers in the district. Neither at Gympie on the Mary, nor at Gayndah and other places along the Burnett, did those with whom I conversed on the subject recognise *Ceratodus* under either of these names. It has however two common names, one of which is the "Burnett Salmon," and the other the "Barramunda." Care has, however, to be taken when the latter name is used, since this is properly applied to a very different form, a true teleostean fish (*Osteoglossum leichardti*), which is not found

in the Mary or Burnett Rivers, but further north, in the Dawson and Fitzroy. The name of Burnett Salmon is given for the simple reason that the flesh is of a pink colour; beyond this, there is not the slightest resemblance between the two forms. In his recent report of the Queensland fishes, Mr. Saville Kent states that the *Ceratodus* is much prized as food. This is a mistake, for, as a matter of fact, it is very oily and disagreeable and only eaten by Chinese and those who can afford to get nothing better. From a scientific point of view this is a great advantage and will in no small degree tend to ensure its preservation.

The Burnett River runs in a wide channel, with banks often as much as fifty feet high, through country which is very sandy and undulating with hill ranges, the surface being composed in large part, at all events, of decomposed granitic rocks. For the greater part of the year, during all the warm months, the river channel shows wide sand banks, with only a comparatively narrow and shallow stream of water, broadening out every now and then into wide deep pools, where the river bed and banks are often formed of great granite rocks. Into the river run numerous creeks, the beds of which are usually quite dry and sandy in summer. The *Ceratodus* always stays in the deep pools, and fishers know well that it is to these they must go if they want to catch the animal. It is possible that on rare occasions it might bury itself in the mud, or to speak more correctly sand, but it by no means normally does this, and speaking generally, I think it is safe to say that *Ceratodus* always stays in the deep pools which through the heat of summer retain at any rate a fair supply of water. In a season of drought these pools may become isolated, but it is a rare season in which there is not a plentiful trickle from one pool to another, and some of these pools are quite a mile long.

Whilst *Protopterus* makes cocoons of mud for itself during the season of drought and is enabled to live through the latter by the aid of its lung, its ally, *Ceratodus*, does no such thing. Quite on the contrary, I believe that its lung is, at all events as useful to it, if not more so, during the rainy as during the hot season; at the same time, it is always of use as a subsidiary organ of respiration.

It may here be mentioned that out of the water *Ceratodus* is the most helpless and passive creature imaginable. It is perfectly incapable of movement, its weak limbs, which

serve well enough as paddles in the water, being quite incapable of sustaining the weight of the body or of assisting in movement. You may put a *Ceratodus* within a few feet of the water, and there it will lie perfectly passive and making not the least attempt to move. When left in air without being surrounded by damp moss or weeds, its life is limited to a very few hours, eight or ten at most—a length of time exceeded by both the eels and dew fish taken from the same water. If kept damp, however, it will live for a considerable time, and may be carried alive for long distances in this way.

It is most interesting, however, to watch the animal on land. The gill flaps remain closed, and the animal opens and closes its mouth at regular intervals in such a manner as at once conveys the idea of breathing. Not only this, but when in the water it comes at intervals to the surface and expires and inspires air. In the evening, when seated by the edge of a pool, one can hear what the fishermen of the district call a “spouting,” and which is due, as in the case of the whale, only on a much smaller scale, to the expiration of air just as the animal reaches the surface. I was not able to actually see the *Ceratodus* doing this, but was assured by several who were well acquainted with its habits that the noise was made by the *Ceratodus*.

When the season is very dry and a comparatively small pool is chosen, it is possible, by continuously stirring up the mud and sand, to choke the fish but at the same time, though the latter are killed, the *Ceratodus* will continue alive.

Now, if we take into consideration the nature of the country through which the Burnett River runs and the fact that the *Ceratodus* does not require to, and practically never does, leave the water pools, we may gain some idea of what is at all events one chief use, if not the main one, of the lung structure.

In the rainy season the creeks, dry in summer, become converted into roaring torrents; the river rises suddenly, as much sometimes as fifty feet in a very few days, and down from the hills and the country round an enormous amount of sand is swept suddenly into the water. When once the big sand banks of the River have been seen in dry weather it is easy to realize what a vast amount of sand must be swept down into the stream at flood time every year and of

what great advantage must be the possession of an organ which will enable *Ceratodus* under such circumstances to breathe air directly whilst at the same time it remains in its ordinary element.

It is thus probably during the flood season when the waters are muddy that the lung is of great service to the animal. At the same time, in seasons of drought, if the animal be left in a comparatively small pool, the waters of which get almost stagnant and foul from the decomposition of the fast growing weeds, the possession of the lung would again be of the greatest value. On the whole, however, if we consider the nature of the country, the sudden floods to which yearly the river is liable, with the consequent pollution of the water, together with the fact that the animal lives in deep and extensive pools, we shall probably be right in concluding that the lung is of especial advantage during the wet, rather than during the dry season.

It may be noted in conclusion that *Ceratodus* seems to live principally, if not entirely, on vegetable matter. The alimentary canals of those which I opened in late September and early October, being filled with the fruit of the gum tree *Eucalyptus tereticornis* which overhangs the river banks. The fruit seems to pass entire into the alimentary canal without being crushed by the teeth in the mouth.

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